Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington DC 20554

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| In the matter of: | ) | |
| Amendment of the Amateur Service Rules to Facilitate Use of Spread Spectrum Communication Technologies | ) | RM-11325 |

# Comments Regarding the Petition to Remove Automatic Power Controls on Spread Spectrum emissions filed by the American Radio Relay League on 1 March 2006.

My name is Timothy P. Gorman, AB0WR and I am a licensed amateur radio operator and a member of the American Radio Relay League. I have been active in amateur radio for more than 40 years. I have a BSEE degree from the University of Kansas.

## I. Background and Introduction

1. The ARRL proposal says "The only change would be that Amateur SS equipment would not have to be configured to calculate the lowest transmitter power necessary by reference to a remote receiver or to multiple receivers (which has proven to be an impossible task in many applications). The minimum transmitter power can be determined more flexibly, and practically by the Amateur station transmitting the SS emissions, using whatever techniques are necessary to comply with the minimum power rule."

## II. Discussion

2. On narrow-band modes that use audible operator-to-operator communication (e.g. SSB or CW), the ability to implement power control is inherently built into the mode. Each control operator is actively listening directly to the incoming signal and can adjust his transmitter accordingly based on received signal strength. The use of digital data has increasingly removed this direct feedback since most operators do not listen directly to the incoming signal but rely more and more on "waterfall indicators" for tuning or rely on accurately tuned transceivers working on standard, preconfigured frequencies. This results in digital operations typically taking place at maximum power levels regardless of conditions.

3. For SS power control to work, the Amateur station doing the transmitting must STILL determine conditions at the receiving station in order to tell how much power is needed. The ARRL does not state how this will be done, they only make vague reference to "whatever techniques are necessary".

4. The *only* practical way this can be done is via feedback from the receiving station. Since most operators using spread spectrum will not be able to use audible feedback to adjust power levels, *some* kind of feedback message will have to be provided from the receiving end to the transmitting end. This message will either have to cause an automatic power decrease or will have to result in an indication to the control operator that power should be reduced.

5. Increasingly with digital operations (and SS is no different) there may very well be no control operator at the transmitting SS station in many situations. It is unclear from the ARRL petition just how the power control will be accomplished in this situation if it is not done automatically.

6. The ARRL proposal is ignoring one major component of the shared spectrum it operates in. As presently stated in the FCC regulations, the power control equation includes the following components:

a. Eb, the received signal strength
b. No, the noise level at the received end
c. Io, the narrow-band signal strength in the SS spectrum area

7. Many of the off-the-shelf components used for SS today are 802.11 based. The Linksys WRT-54G series of units already implement some power controls based on the Eb and No components. Implementing power controls using these metrics should be simple for any communication system implemented on the amateur bands. If nothing else, simple measurement of an IF amplifier AGC loop coupled with appropriate scaling factors would be more than sufficient to provide proper metrics. All that would be left would be to provide this data from the received end to the transmitting end for use in implementing power controls, typically known as ALC (Automatic Level Control) in SSB transmitters used on HF frequencies. This could be done with control signals passed between application level

programs (Level 3 and above in the ISO model), or even by sub-audible tones if using voice transmission instead of direct data protocols.

8. The missing metric here is the use of the Io component of the power control equation. I have seen no mention in any amateur literature discussing how to measure the impact of secondary use SS operations on primary use narrow-band users. Without a way to measure this component there is no way for automatic operation to determine how to set power controls nor is there a way for a manual operator to accomplish the task either. Ignoring this metric of the power control algorithm is, however, guaranteed to result in interference to narrow-band operations in the same spectrum space.

9. In essence, what removal of this restriction will do is condone continuous operation at the maximum level for all stations using Spread Spectrum. This *will* result in increased noise floors for narrowband users and *will* decrease the number of coincident SS users in a specific frequency allocation. This proposal is an unstated recognition of the fact that experimenters using SS techniques (primarily with off-the-shelf equipment) have not developed or implemented measures to insure that interference to primary-use narrow-band operations does not happen. It is a request to confer primary use status on SS operations.

10. Current regulation provide for operation at the 1 watt level if no Automatic Power Control is provided for in the equipment being used. The proposal provides no analysis showing why that power level should be increased to 100 watts.

11. At the frequencies allocated for SS operation today, 70cm and above, typical radio horizons are slightly longer than the line-of-sight horizon. Actual operational experiments have shown that the typical 200mw off-the-shelf 802.11 router can provide consistent operation over a path length of 10km if gain antenna's of 14dbi are used. If a typical radio horizon of 20km is used, a 1 watt signal would give an equivalent received signal using +14dbi antennas. A 10 watt signal level would allow an omni-directional antenna to be used for point-to-multipoint operation at a slightly shorter path length.

12. Based on these calculations there does not appear to be any justification for allowing an unfettered use of output powers in the range of 100 watts. Certainly the proposal offers no justification for doing so.

## III. Conclusion

12. This proposal appears to be nothing more than a request to promote Spread Spectrum operation to primary use status in the allocated spectrum and to remove any restrictions on poser level up to 100 watts. This will most definitely result in an increased noise floor to narrow-band operations in the same spectrum, will result in signficant interference to Part 15 users in the same spectrum, and will result in an effective decrease in the number of potential SS users in the spectrum. No interference mitigation studies are provided, no operational studies are provided showing projected operational areas with path loss requirements to be overcome, and no mention is made of methods for manually operated stations to avoid interference to narrow-band conversations.

## IV. Recommendations

13. This petition should be denied until the petitioner can provide technical studies showing why automatic power controls cannot be implmented using at least the Eb and No metrics, especially since Part 15 equipment already in use have implemented such controls. Technical studies showing why the Io metric cannot be implemented should be provided. There should also be a detailed study showing why the 100 watt level for uncontrolled operation at frequencies of 70cm and above is needed based on expected path lengths and attendent path loss.

I appreciate the opportunity you have provided to comment on this proposal. I eagerly await your final decision.

Timothy P. Gorman, AB0WR